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The advantages of a high pressure sodium arc discharge have been known for quite awhile. The development of a practical, long-lived lamp for general lighting using the high pressure sodium discharge required a major breakthrough in material technology. The development of a new ceramic, polycrystalline aluminum oxide, was the key to making the high pressure sodium lamp a practical reality. This material is extremely resistant to attack by sodium vapor, can stand the very high operating temperatures required for maximum efficiency, and yet has excellent transmission characteristics for visible light.

LAMP CONSTRUCTION

Lumalux Lamps

The basic parts of a Lumalux® lamp are shown in Figure 1. Similar to SYLVANIA Mercury and Metalarc® lamps, it has a two-bulb construction, with an outer bulb "jacket" and an inner "arc tube." The ceramic arc tube contains the electrodes, sodium-mercury amalgam, and a small amount of xenon. The outer bulb of weather-resistant glass protects the arc tube from damage and contains a vacuum, which reduces convection and conduction heat loss from the arc tube to ensure high efficacy.

The arc tube in the Lumalux lamp is long and slender and is made from a ceramic, polycrystalline aluminum oxide. The geometry is dictated by the requirement for high temperature to vaporize sodium. The ceramic is required to withstand these high temperatures. The tube is translucent and is ideally suited to high intensity discharge light generation and transmission, with a transmittance of approximately 95 percent in the visible wavelengths. Because of its freedom from impurities and small pores, it is extremely resistant to the corrosive effects of hot sodium. Sodium at these elevated temperatures deteriorates quartz and similar materials very quickly.

Lumalux lamps are constructed with monolithic arc tubes and end seals which are schematically represented in Figure 2. The monolithic design uses a ceramic material identical to that of the body of the tube to seal the major area of the end. A niobium tube through the center of the end is used to make the electrical connection and the electrode, and to seal the discharge vessel. Most of the significant sodium loss mechanisms operate in the area of the seals. Minimization of frit sealing material, which is used to cement the metal to the polycrystalline aluminum oxide, is achieved with this design. This reduces or eliminates much of the area in which sodium can be lost to the arc stream, and results in a lamp that has a very low voltage rise over life and ensures long lamp life.

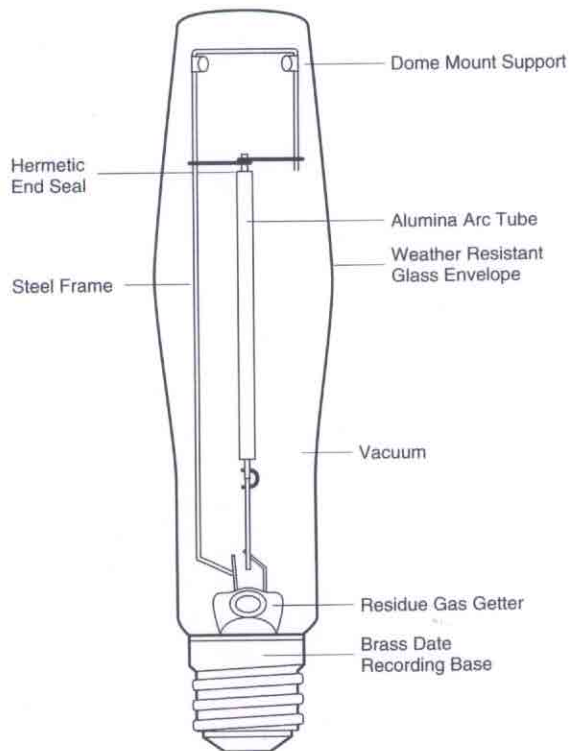


Figure 1. Basic parts of the Lumalux lamp.

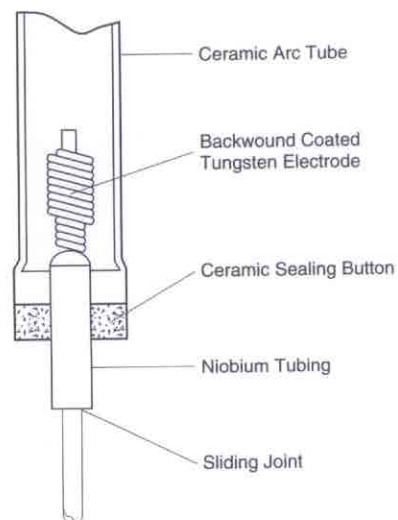


Figure 2. Monolithic construction.

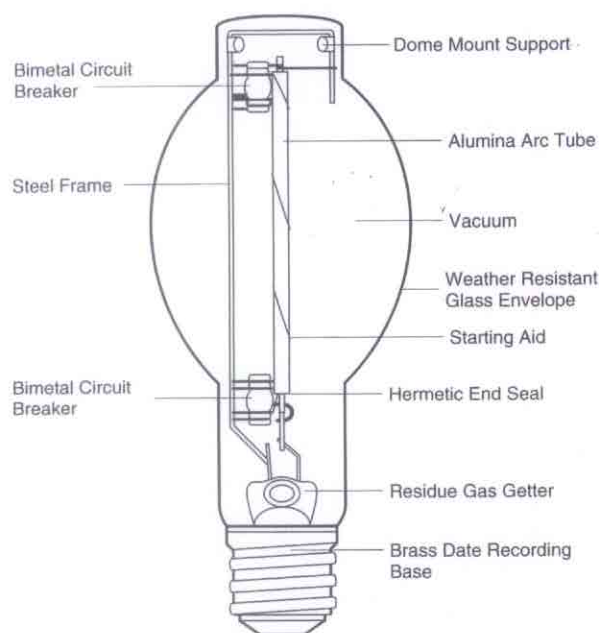


Figure 3. Basic parts of the 750-Watt Lumalux lamp.

The concept of locating the amalgam reservoir inside the discharge tube is incorporated along with the monolithic seal. The reservoir will form in the coldest spot within the arc tube and typically will be found behind the electrodes. By eliminating the need for an external reservoir, the Lumalux lamp can be operated in any position. This provides two significant advantages to the user. First, the lamp does not have to be ordered in a base up, base down, or horizontal version, simplifying stocking procedure. Second, the lamp cannot be mis-installed. If the correct lamp is selected, it will be in the correct operating position regardless of orientation.

The efficiency of the high pressure sodium lamp is critically dependent upon a specific vapor pressure of the sodium within the tube. To maintain this vapor pressure, the amalgam temperature must be the same regardless of the arc tube construction. Since the seal of the inside reservoir monolithic design is contiguous with the amalgam cold spot, the seal must operate at the amalgam cold spot temperature. In the case of the external reservoir metal end cap design, the amalgam cold spot is remote from the seal. A significant temperature gradient must exist between the seal and the amalgam cold spot, with the seal operating at a significantly higher temperature than the external reservoir cold spot. Thus, it is easily understood that the seal of an external reservoir metal end cap design must necessarily run hotter than the seal of the inside reservoir monolithic design. The higher temperature tends to accelerate the reaction between the sealing material and

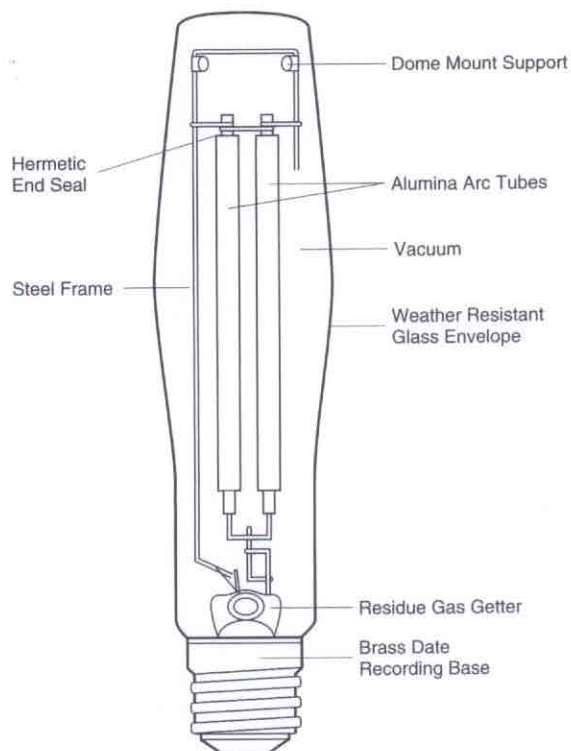


Figure 4. Basic parts of the Lumalux Standby (SBY) lamp.

sodium, tying up sodium and increasing the sodium loss from the arc stream. This, of course, leads to a higher rate of lamp voltage rise for the external reservoir design. The internal reservoir monolithic design arc tube significantly reduces the rate of sodium loss and, as a result, provides a very long-lived lamp.

Alignment of the arc tube within the outer jacket in mogul-base lamps has been improved by a centering rod. A sliding joint allows normal travel of the arc tube due to thermal expansion, and also provides excellent resistance against arc tube displacement due to mechanical shock. All the welds to the arc tube electric feed-throughs are niobium-to-niobium, ensuring metallurgical compatibility at high-temperature junctions for reliable performance.

Lumalux 750-Watt Lamps

The 750-watt Lumalux lamp shown in Figure 3 has several additional components other Lumalux lamps do not have. These are a pair of bimetal circuit breakers and a wire coiled around the arc tube called a starting aid. These components are in the added starting circuit used in this lamp. The LU750 is designed with a significantly higher fill gas pressure than other lamps and this starting circuit is needed to ensure reliable starting.

Lumalux Standby (SBY) Lamps

The essential design features of the Lumalux Standby (SBY) lamp are the same as the standard Lumalux lamp, except that there is a second arc tube in the lamp. The second arc tube is electrically and mechanically parallel to the first.

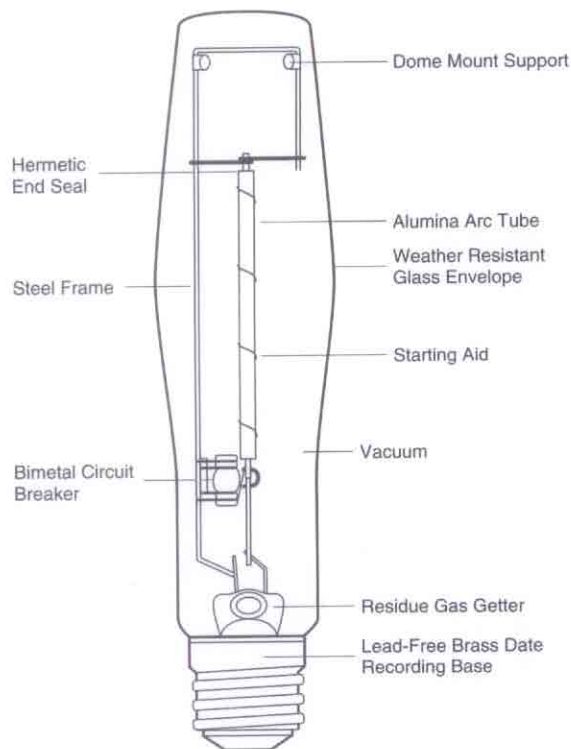


Figure 5. Basic parts of the 400W Lumalux Plus lamp.

The second arc tube will ignite immediately after power is restored to the lamp terminals following a momentary power interruption. A lamp with a single arc tube must cool for at least a minute after extinction before it will restart. The immediate restoration of some light—about 10 percent of a full light output—satisfies most code requirements for standby lighting and eliminates the need for standby incandescent sources and switching equipment.

Lumalux Plus Lamps

The basic construction of the Lumalux® Plus™ lamp is shown in Figure 5. There are some differences in design details in order to provide the additional performance features. The design objective of the Lumalux Plus is the elimination of the characteristic end-of-life "on-and-off" cycling behavior that makes high pressure sodium lighting system maintenance difficult.

The technology that eliminates the cycling behavior reduces the mercury content of the lamp dramatically, but requires high xenon gas fill in the arc tube. Consequently, a starting aid is required. Coupled with the mercury reduction in the arc tube, the Lumalux Plus has a new base design that uses no lead solder. The combination of the reduced mercury content in the arc tube and the elimination of lead in the base make the Lumalux Plus an environmentally friendly high pressure sodium lamp.

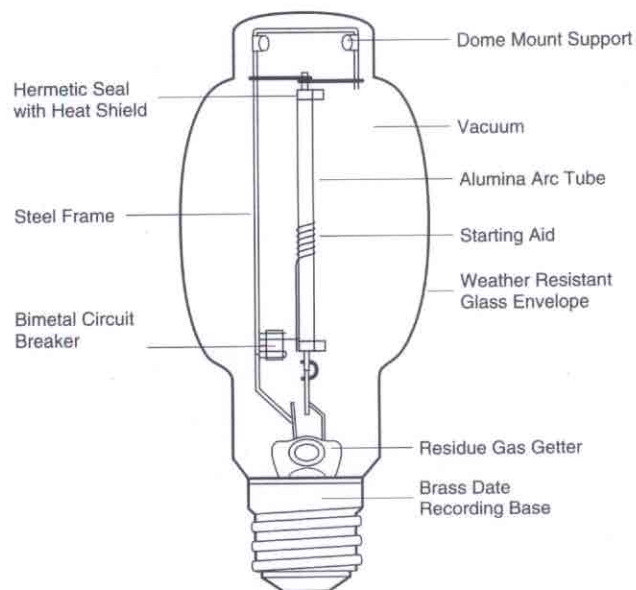


Figure 6. Basic parts of the Unalux lamp.

Unalux Lamps

The basic construction of the Unalux® lamp is shown in Figure 6, and is similar to the Lumalux lamp except that the arc tube contains argon and neon gas rather than xenon.

The BT (bulged tubular) outer jacket style, used for mercury lamps, is used for Unalux lamps. This is done to maintain light center length and maximum overall length, so that the lamp is physically compatible with mercury equipment on a retrofit basis.

The starting aid is coiled around the arc tube and is electrically connected through a thermal circuit breaker to the electrode at the opposite end of the tube. When potential is applied, ionization takes place between the starting aid and the adjacent electrode, causing the gas to become sufficiently conductive to allow the arc to strike from electrode to electrode. As the lamp warms up to operating temperature, the circuit breaker opens and isolates the starting aid, eliminating the possibility of electro-chemical reactions with hot sodium vapor and ensuring long lamp life and reliable performance.

The Unalux lamp is manufactured with a monolithic seal, discussed in detail elsewhere in this bulletin. The major benefits derived from the monolithic seal arc are long lamp life due to low voltage rise, and the universal burning position feature which eliminates dual inventories and installation errors.

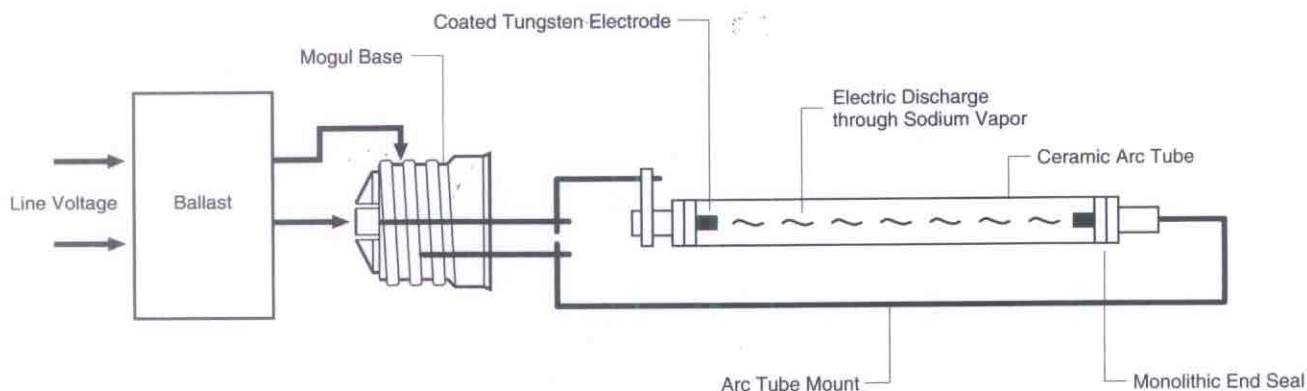


Figure 7. Electrical circuit of the Lumalux lamp.

THEORY OF OPERATION

Lumalux Lamps

The Lumalux lamp is the most efficient member of the high intensity discharge lamp family. However, its physical, electrical and photometric characteristics are different from other H.I.D. lamps.

The principal radiation element in the arc of the Lumalux lamp is vaporized sodium. Light is produced by passing an electrical current through vaporized sodium under pressure at high temperature. Mercury is included as a buffer gas for color and voltage control. There is also a small quantity of xenon gas in the arc tube which is used to initiate the starting sequence.

Since long, narrow arc tube geometry is required for maximum efficiency – and since xenon is used as a starting gas and starting probes are not used – extremely high voltages are necessary for lamp ignition. The starting function is accomplished by an electronic starter circuit which works in conjunction with the magnetic component of the ballast. The starter supplies a short, high-voltage pulse on each cycle or half cycle of the supply voltage. The pulse is of sufficient amplitude and duration to ionize the xenon gas and initiate the starting sequence of the lamp. Specific values of the pulse width and amplitude required for the various sizes of Lumalux lamps can be seen in the OSRAM SYLVANIA High Pressure Sodium Specification Guide.

The ballast also has to provide the usual ballasting functions, such as providing sufficient open circuit voltage to sustain the arc, limiting lamp operating current and regulating the lamp power as a function of both lamp and line voltage. A simple connection diagram of a Lumalux lamp and ballast is shown in Figure 7.

The high pressure sodium lamp is made with an excess of sodium, which is in the form of an amalgam with mercury. Over a period of operating time, some of the sodium is lost to the arc stream through several mechanisms. As the ratio of sodium to mercury pressure

changes, the arc voltage rises. Eventually, the lamp operating voltage will rise to a level beyond the ballast's ability to sustain. When this happens, the lamp will start, warm up to full brightness, and then extinguish. This sequence is repeated regularly and is called cycling. This symptom is the normal end-of-life failure mode of high pressure sodium lamps.

Figure 8 shows a preferred lamp voltage versus lamp wattage ballast characteristic which tends to control the rate of voltage rise. The negative slope beyond rated voltage decreases wattage with increasing lamp voltage, thus decelerating the voltage rise.

The warm-up period for a Lumalux lamp to reach full brightness is about three to four minutes – somewhat less than that of a SYLVANIA Mercury or Metalarc® lamp. During warm-up, there are several changes in the color of the light. Initially, there is a very dim, bluish-white glow produced by ionized xenon. This is quickly replaced by

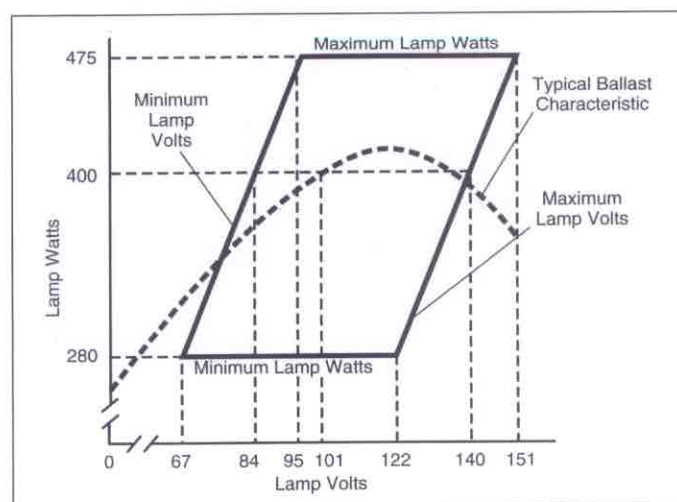


Figure 8. Lamp voltage-wattage limits for 400 watt high pressure sodium lamps.

a typical blue, brighter mercury light. With an increase in brightness, there is a change to monochromatic yellow which is characteristic of sodium at low pressure. Then, as the pressure in the arc tube increases, the lamp comes to full brightness with a golden-white light. Should there be a momentary interruption of power, the restrike time is approximately one minute.

Lumalux Standby (SBY) Lamps

As noted earlier (see page 4), Lumalux Standby lamps, unlike single arc tube Lumalux lamps, are designed to light up immediately when power is restored after a momentary power outage. The individual arc tubes in the standby lamp are the same as those in a single arc tube lamp. However, the paired arc tubes in the standby lamp take advantage of a combination of an arc tube characteristic and a lamp/ballast system characteristic.

In a single arc tube lamp, the arc tube will not reignite after a momentary power interruption until the tube has cooled sufficiently for the pulse voltage to reignite it. In a standby lamp, the arc tube that is not ignited remains at a temperature substantially below full operating temperature. When power is restored after a momentary interruption, the pulse voltage is sufficient to start the second or standby arc tube immediately.

Lumalux Plus Lamps

The Lumalux Plus arc tube is a dose-limited design that is different from standard high pressure sodium lamps, including Lumalux and Unalux, that have sufficient mercury sodium amalgam to compensate for sodium loss over life. It is this large dose that leads to cycling behavior in standard high pressure sodium at the end of life.

The design of the Lumalux Plus is aimed at reducing sodium reactions in the arc tube. The low amalgam content does not allow lamp voltage to rise over life and therefore eliminates the cycling behavior. At end-of-life, instead of cycling, Lumalux Plus lamps will not turn on

at all. Lumalux Plus lamps operate on standard high-pressure sodium ballasts for corresponding wattages.

Unalux Lamps

Unlike Lumalux lamps, the Unalux lamp is specifically designed to operate on mercury lamp ballasting equipment. As a result, its electrical characteristics are similar to the equivalent mercury lamp it is designed to replace. Moreover, photometric characteristics are completely different from mercury and are very much like standard Lumalux lamps.

The electrical circuit of the Unalux lamp is shown schematically in Figure 9. As indicated in the illustration, the arc tube is very similar to the Lumalux arc tube. Unlike the Lumalux lamp, however, an electronic starter board is not required. By design, the Unalux lamp has a carefully balanced mixture of rare gases which operates in conjunction with a starting aid that is wound around the arc tube. This combination ensures starting of the Unalux lamp at the mercury lamp open circuit voltages.

Unalux lamps will operate satisfactorily on lag-type mercury ballasts and most series street lighting mercury ballasts. Unalux lamps operate at lower wattage on the mercury ballast equipment than do the mercury lamps. Operating wattage savings are generally in the range of 10 to 15 percent.

The Unalux lamp is generally considered a retrofit lamp but there are situations where it is economically competitive with Lumalux lamps, particularly where capital expenditures are a problem. Mercury lighting equipment is generally less costly than conventional high pressure sodium equipment. It should also be recognized that the mercury ballast types that will operate Unalux lamps are more efficient than standard high pressure sodium equipment. Another advantage in using Unalux lamps is that maintenance and troubleshooting are simplified because the starter circuit is not required.

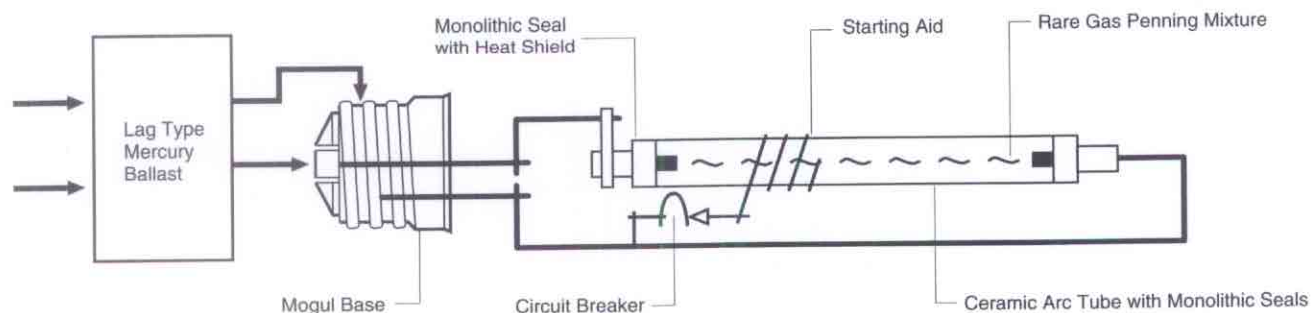


Figure 9. Electrical circuit of the Unalux lamp.

OPERATING CHARACTERISTICS

Efficacy

The most important feature of Lumalux and Unalux lamps is their high efficacy. Initial efficacy is better than twice that of an equivalent wattage mercury lamp. The output of the Lumalux and Unalux lamps range from the 35-watt, in excess of 64 lumens per watt, to the 1000-watt which provides 133 lumens per watt.

Lamp Life

In common with other H.I.D. sources, Lumalux and Unalux lamps have long average life. A typical mortality or life expectancy curve is shown in Figure 10. Like Mercury and Metalarc lamps, the life is affected by operating hours per start and is longest with continuous operating. The OSRAM SYLVANIA High Pressure Sodium Specification Guide lists average rated life at ten hours per start and mortality curves for all High Pressure Sodium lamps.

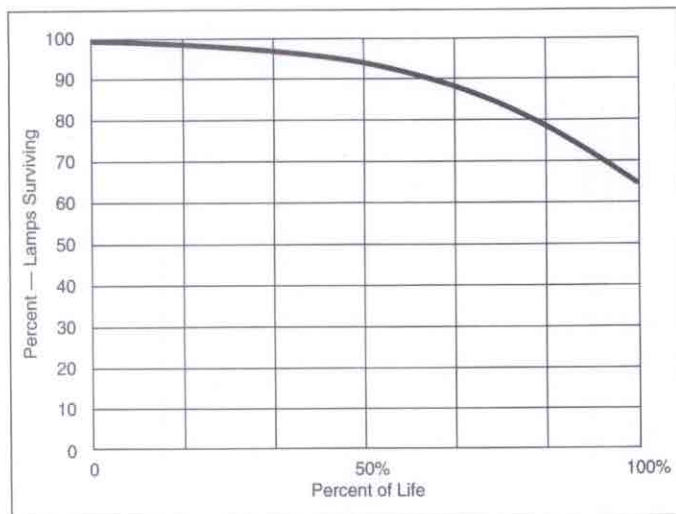


Figure 10. Typical Mortality Curve.

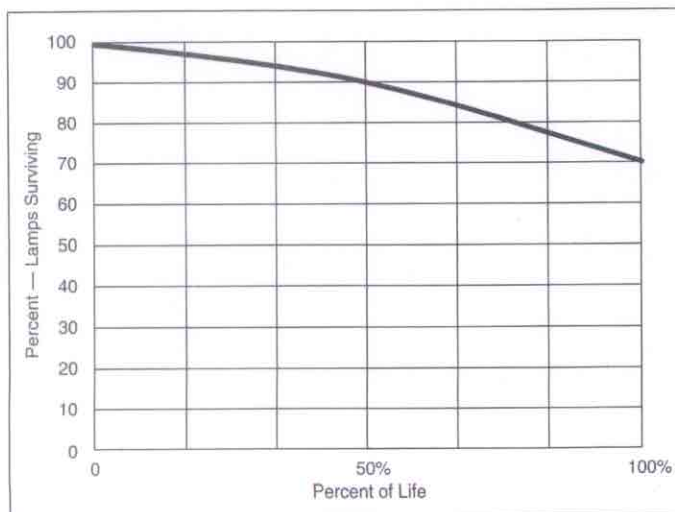


Figure 11. Typical Lumen Maintenance Curve.

Lumen Output and Maintenance

On a lumens-per-watt basis, Lumalux and Unalux lamps are extremely efficient converters of electrical energy into light. Light output, however, gradually declines throughout life, as shown in Figure 11, a typical Lumen Maintenance Curve. The mean lumens, measured at 50% of rated life, are approximately equal to 85 to 90 percent of the initial values. For lamp-specific Lumen Maintenance Curves, see the OSRAM SYLVANIA High Pressure Sodium Specification Guide.

Operating Position

A significant benefit from the SYLVANIA monolithic seal construction is that it is no longer necessary to stock separate lamp types for base-up, base-down, or horizontal operation. A single type in each wattage will now fulfill all application requirements regardless of the lamp operating position. This not only simplifies ordering and stocking of lamps, but also eliminates any possibility of installation errors.

Warm-up and Restrike Time

As described earlier, Lumalux and Unalux lamps reach full light output in about three to four minutes. During warm-up, there are several changes in color of the light. Initially, there is a bright red glow created by the neon which is one of the constituents of the rare gas fill. This red is shortly replaced by the typical blue mercury light. As the lamp continues through its warmup cycle, the blue is replaced by a monochromatic yellow radiation, which is characteristic of sodium vapor at low pressure. As time passes, both pressure and temperature increase and the lamp comes to brightness with a golden-white light. After a momentary power interruption, restrike time for Lumalux lamps is approximately one minute, and for Unalux lamps approximately three minutes.

Fixture Effect Voltage Rise

There may be an increase in lamp operating voltage when a lamp is operated in a fixture as opposed to a lamp that is operated in free air. This effect is called fixture voltage rise. This rise is due to the re-radiating effect of the fixture back upon the arc tube. Fixture voltage rise limits for Lumalux Lamps and for Unalux

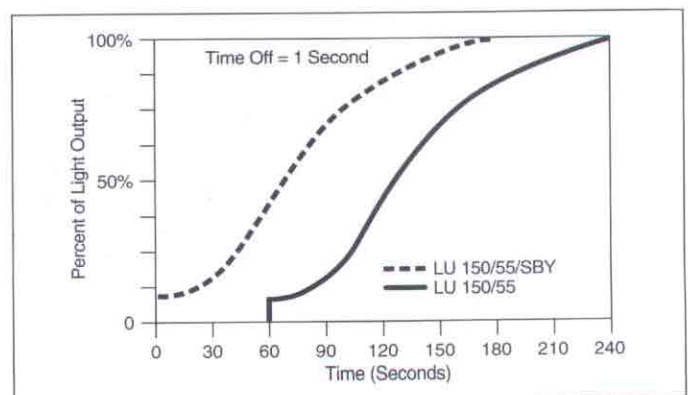


Figure 12. Lumen Relight/Time Curves.

Lamps can be seen in the OSRAM SYLVANIA High Pressure Sodium Specification Guide. Excessive voltage rise will reduce lamp life.

Lumalux Standby (SBY) Lamps

Figure 12 shows the percentage of SBY lamp light output as a function of time after transition or restrike. Lumen maintenance and mortality for Lumalux Standby lamps can be seen in the OSRAM SYLVANIA High Pressure Sodium Specification Guide.

WARNINGS

Lumalux, Lumalux Standby and Lumalux Plus Lamps OPERATE WITH COMPATIBLE BALLAST AND FIXTURE ONLY:

These lamps must be operated in a fixture with a ballast which has an ANSI designation identical to that found on the lamp outer glass bulb, otherwise the lamp may rupture resulting in the discharge of hot particles. If rupturing occurs, there is a risk of personal injury, property damage, burns and fire from hot particles or shattered glass.

Do not remove or insert lamps when power is on. If outer glass bulb is broken, shut off power immediately and remove lamp after it has cooled. Do not expose operating lamp to moisture. Replace the lamp if outer glass bulb has been scratched, cracked or damaged in any way. Electrically insulate any metal support in contact with the outer glass bulb to avoid glass decomposition.

Unalux Lamps

OPERATE WITH COMPATIBLE BALLAST AND FIXTURE ONLY:

This lamp will operate safely and perform satisfactorily **only** when used with conventional high leakage reactance lag type auto-transformer or reactor mercury ballasts as indicated in the table below, otherwise the lamp may rupture resulting in the discharge of hot particles. If rupturing occurs, there is a risk of personal injury, property damage, burns and fire from hot particles or shattered glass.

To avoid premature lamp failure, do not use with CW or CWA Ballasts, auxiliary equipment specifically designed for conventional high pressure sodium lamps or equipment not meeting the conditions in Table 1.

Unalux ANSI Type	Mercury Ballast No.	Mercury Lamp Wattage	Approximate Unalux Lamp Wattage
ULX-150	(H39)	175	150
ULX-215	(H37)	250	215
ULX-360	(H33)	400	360
ULX-880	(H36)	1000	880

Table 1. Ballast Specifications.

BALLASTS

Lumalux, Lumalux Standby and Lumalux Plus Lamps

The Lumalux lamp has electrical characteristics that are considerably different from those of other H.I.D. lamps. Operating voltages and currents do not correspond to those of similar-wattage mercury or metal halide lamps. As a result, special ballasting equipment is required.

A ballast for a Lumalux lamp must provide the high-voltage starting pulse, limit lamp current and regulate lamp power as a function of line voltage and lamp operating voltage. All Lumalux ballast types have two basic parts: an electronic starting circuit and the magnetic component. Lamp and ballast requirements are governed by the applicable ANSI specifications. There are differences between ballasts and the specific application conditions that should be carefully considered when choosing a ballast. When a lamp fails or is removed, the ballast is subjected to its starting sequence continuously. This can have an adverse effect on ballast life. The specific ballast manufacturer's recommendations should be followed regarding the time in which a defective or removed lamp should be replaced.

The starting pulses required for Lumalux lamps are short duration and, as a result, have high-frequency components which are attenuated over fairly short distances. If the distance is too great, poor starting will result. The specific ballast manufacturer should be contacted for limits and recommendations.

Unalux Lamps

Unalux lamps are designed to operate on 240- and 277-volt mercury reactor ballasts, mercury lag autotransformer ballasts, and most mercury series ballasting equipment. These ballast types have the required lamp voltage-lamp wattage characteristic; i.e., reduction of lamp wattage as lamp voltage increases past rating. This tends to keep wattage relatively constant over lamp life.

Unalux lamps do not have the pulse requirement of standard Lumalux lamps, and can be operated remotely, similar to mercury lamps. In the situation where a large distance between lamp and ballast is required, Unalux lamps are recommended.

SPECTRAL CHARACTERISTICS

Spectral Power Distribution

The older, low pressure sodium vapor lamps produce a yellow light with the visible energy radiated at two closely spaced wavelengths of 589.0 and 589.6 nanometers in the yellow region of the spectrum. At the high temperature in the arc stream of the Lumalux lamp, however, the normal sodium radiation is altered and becomes a continuous spectral energy distribution, as shown in Figures 13 and 14. To the eye, the light produced appears to be golden white in color.

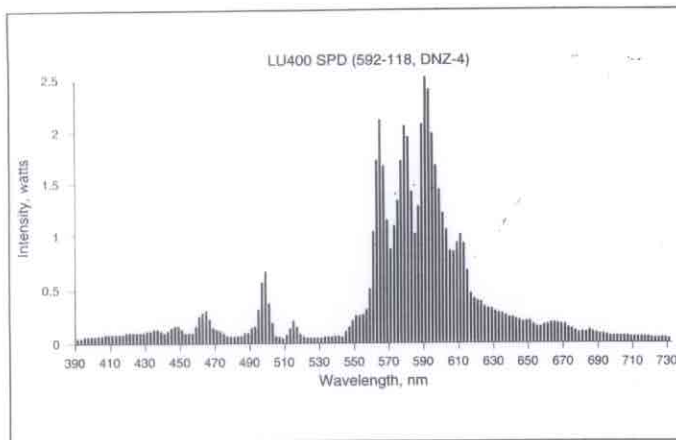


Figure 13. Spectral power distribution of the 400-Watt Lumalux lamp.

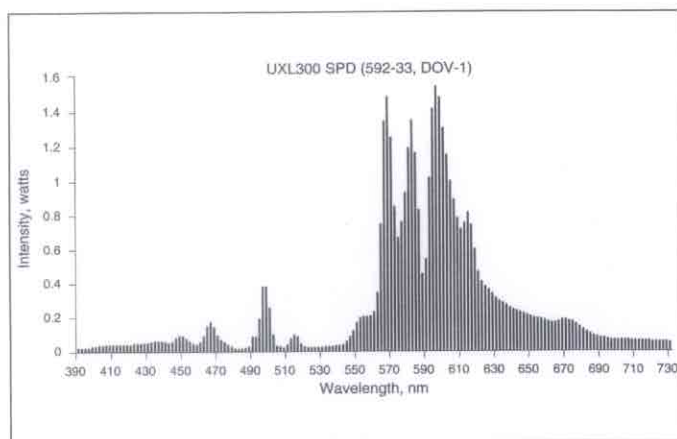


Figure 14. Spectral power distribution of the 360-Watt Unalux lamp.

The radiation from Lumalux lamps is unlike that from other H.I.D. lamps in that there is no significant energy in the ultraviolet regions.

APPLICATIONS

Lumalux Lamps—Clear and Coated

Lumalux lamps are the best choice when high brightness, high efficiency, and long life are important and color is relatively insignificant. Example: The 400-watt Lumalux lamp gives approximately 48 percent more light (and lasts approximately 24 times as long) as a conventional 1500-watt incandescent lamp. Even when compared with mercury lamps, a 200-watt Lumalux lamp offers the same light output and average rated life as a 400-watt mercury lamp for a 50 percent savings in energy. Since energy is now 80-95 percent of the cost of lighting, Lumalux lamps are more and more the smart choice in lighting for many applications.

Other performance features include approximately 80 to 90 percent mean lumens, much more than any other

H.I.D. lamp, and universal operating position. The wattages range from 35 to 1000 watts, all with 24,000 hours rated life except for the 35-watt lamp with 16,000 hours rated life.

These high-performance H.I.D. light sources have a wide variety of applications including such typical applications as commercial spaces, industrial areas, warehouses, hallways, stairwells, loading docks, and plant growth areas.

Lumalux lamps offer major advantages for outdoor applications that are not color sensitive. These applications include: city streets, highways, interchanges, parking lots, parking garages, bridges, walkways, stairways, shopping centers, institutions and security lighting.

Lumalux Coated Lamps

In various types of lighting applications, it has become apparent that there is a need for high pressure sodium lamps with different source characteristics than those previously available. Particular problems have been related to glare and non-uniform distribution. The solution to these problems lies in modifying the optical geometry of the source. To modify this geometry, an inert diffusing coating is applied to the inside surface of the glass outer jacket.

This coating does not affect lamp color, nor does it increase efficacy as the phosphor does in mercury lamps. Lamp lumen-per-watt performance is reduced slightly.

Clear lamps are ideal for horizontal mounting applications provided that the mounting height is sufficiently high to preclude glare problems. In cases where existing mercury street lighting poles must be utilized, the coated high pressure sodium lamp can provide more uniform levels, offer energy efficiency, and provide a low-glare installation.

Using a lamp with a clear envelope to replace a phosphor-coated lamp can radically change the distribution of the luminaire (see Figures 15 and 16). Most often the result is a narrowing of the distribution with high candlepower directly below the luminaire. This type of problem has occurred in some applications using clear high pressure sodium lamps in open-bottomed fixtures with moderate-to-high spacing to mounting-height ratios. The addition of the diffuser coat in the lamp provides a better optical image for the reflector to work with, and results in a more uniform distribution.

The lamps used to generate Figure 15 were adjusted to operate at 12,000 lumens as was the lamp in Figure 16. The fixture was a typical open-bottom industrial unit. The effect of the addition of the coating is shown very clearly.

The addition of the coated high pressure sodium lamps provides the designer with more lighting options. Standard Lumalux High Pressure Sodium lamps can be used at lower mounting heights and wider spacing while providing uniform illumination.

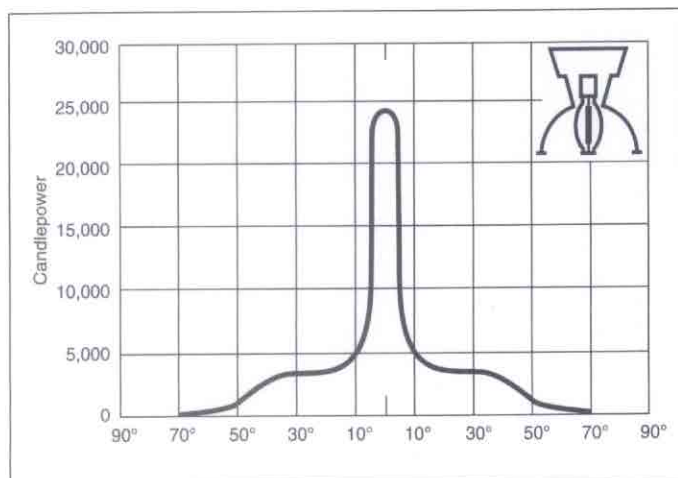


Figure 15. Clear HPS lamp operating at 12,000 lumens in open-bottomed fixture.

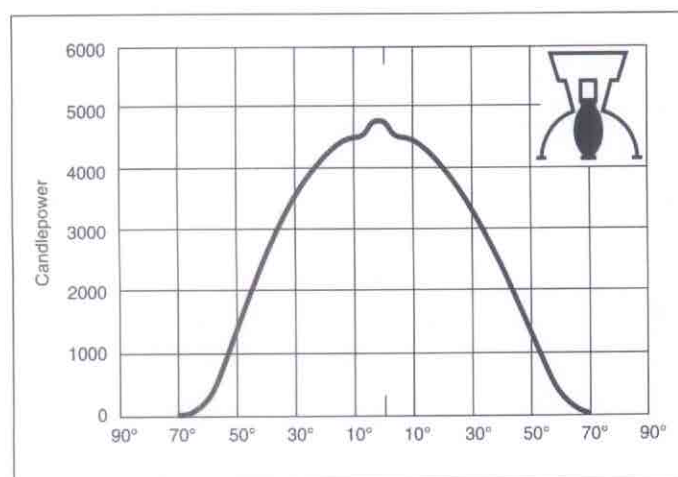


Figure 16. Coated HPS lamp operating at 12,000 lumens in open-bottomed fixture.

Lumalux Standby Lamps

Lumalux Standby lamps are designed to provide light immediately upon power being restored after a momentary power interruption. This immediate supply of light—about 10 percent of full light output—provides safety or security lighting until the standby arc tube warms up in a matter of minutes. Applications for standby lamps include any of the indoor or outdoor Lumalux applications. If the standby feature is not needed, the double arc tube standby lamps can be used as standard lamps with 40,000-hour rated life, almost twice the normal rated life (with the exception of the 1000-watt, which has a rated life of 24,000 hours).

Lumalux Plus Lamps

Lumalux Plus lamps are designed to eliminate the sporadic end-of-life cycling in roadway or industrial lighting systems. Since at end-of-life Lumalux Plus lamps do not turn on at all, it is easy for maintenance crews to locate these high pressure sodium lamps. By reducing the number of service trips required to identify lamps needing replacement, savings on maintenance time and costs can be realized.

In addition, Lumalux Plus lamps are environmentally friendly high-pressure sodium lamps, which is a plus in many areas due to toxic waste disposal regulations. The reduced mercury content in the arc tube, along with the lead-free, mechanically welded base, allow Lumalux Plus lamps to pass Federal TCLP (Toxic Characteristic Leachate Procedure) tests. (NOTE: While Lumalux Plus lamps currently pass Federal TCLP tests, they may or may not pass some individual state TCLP tests which have lower limits).

Lumalux Plus lamps operate on existing high pressure sodium ballasts for corresponding wattages, so no new auxiliary equipment is needed when installing these lamps.

Unalux Lamps

Unalux lamps are retrofit lamps, using the same socket, fixture and lag autotransformer or reactor ballast as the mercury lamps they replace. Although they do not deliver quite the high performance of standard Lumalux lamps, Unalux lamps offer more light with up to 14 percent energy savings compared to mercury lamps. Unalux lamps can be used in the same applications as Lumalux lamps providing the ballast is a lag autotransformer or reactor type. The ULX880 lamp must be operated only on a 480V H36 mercury reactor ballast. Unalux lamps are available in 150-, 215-, 360-, and 880-watt sizes in clear bulbs only.

TROUBLESHOOTING

For complete information on troubleshooting procedures, refer to the OSRAM SYLVANIA Troubleshooting Guide.

For Orders and General Information

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